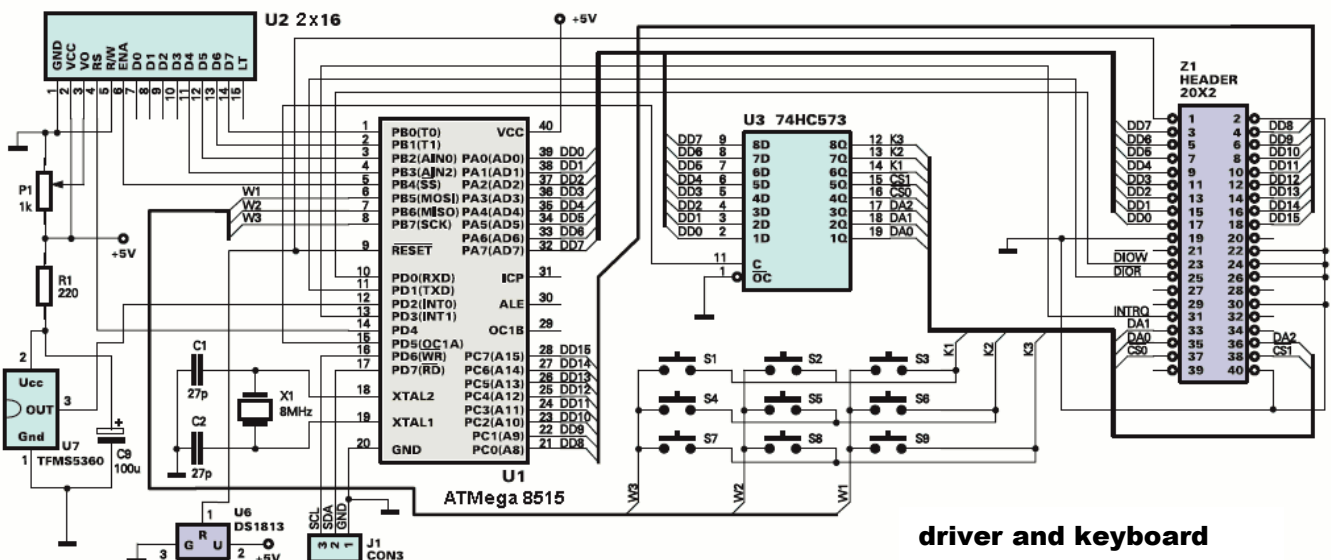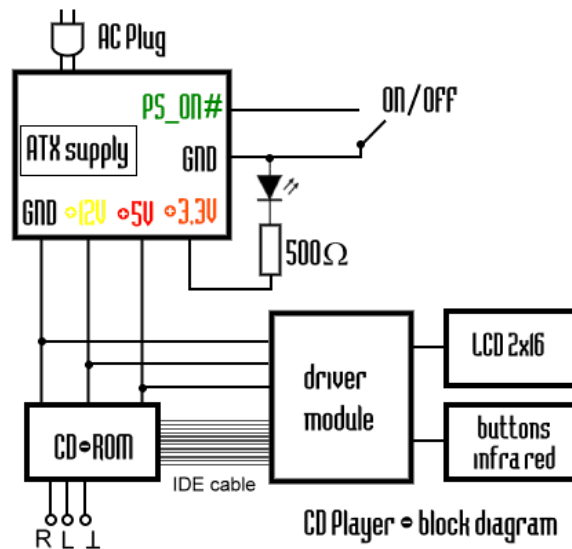# My First CD Player

1. Introduction

This is my last project from 2009. The case is done with 5mm plywood painted mahogany stain without polish. Only typical parts were used in this DIY project. Any changes can be applied.

Features:
· CD-Audio player with 2 drives changer
· eject/stop/play/pause/skip+-/forward/rewind buttons
· 4 play modes – normal, random, loop track, loop disc
· 4 time display mode buttons – elapsed, remaining, elapsed whole disc, remaining whole disc
· controlled with any RC-5 remote control, buttons programming
· 2x16 LCD display (track number, time, status - play/stop/pause/ff/fr)
· CD-Text available
· eject by remote
· mute/standby signal out
· CD1 or CD2 playing information signal out

The project is very cheap using well known ATMega 8515 or older AT90S8515. There are 2 different PCB's for keyboard/ir and for driver. To complete this project you'll need also 1 or (better) 2 CD-ROMs with CD-Text feature and IDE interface. Though any CD-ROM would work properly, even CD-RW and some DVD drives does.

To supply, monitor LED and turn on/off I recommend using any ATX PS. Here is the block diagram for one drive:

CD Player ● block diagram
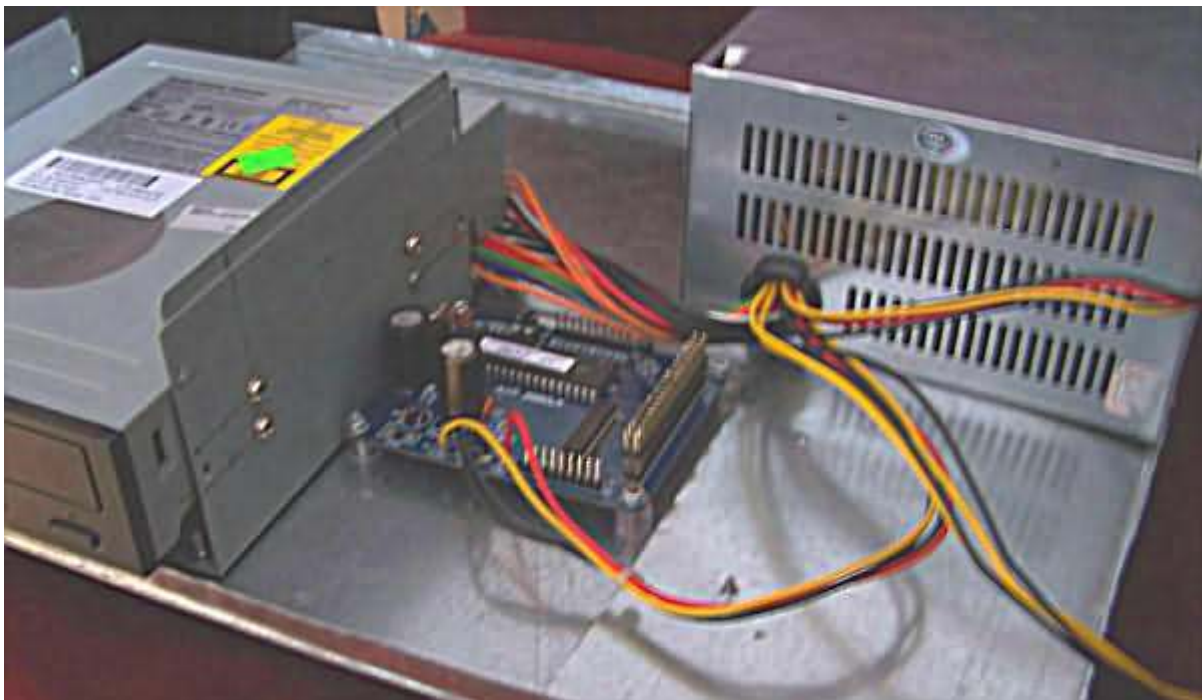

driver and keyboard

2. How it works

When one drive is used you need to set drive to MASTER with jumper. If you want to have doubledecker, set first drive to MASTER and another to SLAVE and connect to the same IDE cable. Though the outputs of CD-ROMs are different you can use any simple mixer to mix them and set to one output. Also you can build any extension switch (selector), because on pin 16 the HIGH signal means CD1 playing and LOW signal means CD2 playing. Standby signal is HIGH on pin 17 when no music playing (can be connected to preamplifier or amplifier).

Switching whole device ON is possible with PS_ON# (green cable) pin connected to ground. Disconnection will OFF device. My idea was also connect a little LED showing the status if device is working or not. A rather great resistor is needed to light the LED only a little bit (modern LED glows very bright, staring at them wouldn't be any fun). You can also add any standby function with +5VSB line. Read more in ATX specification.

When EL lamp in LCD is used you'll need +12V inverter to glow the display. If LED backlight is used you can connect it to +5V via small resistor (500Ω recommended). When nothing is on display after running, try to screw the contrast potentiometer on module PCB.

3. Changes

Firstly, the whole device makes noise. Once because of CD-ROM (So, 48x is better than 56x). To eliminate noise, the case must be stable. After mounting it, you can use any noiseproof material inside, but better is to disassemble fan from power supply first. 2 CD-ROMs wouldn't consume as much power as if it was complete computer system. Also, vibrations are bad friends; simple solution to get rid off them is to use seal washers from any useable material. To mount stable one or 2 drives my idea was to use tin case from damaged power supply and screw it upside down via the gum washers.

To mount all things it is highly recommended to use at least 0,5mm thick stainless tin. Dimensions which I checked to be the best are: 390x300mm. Such base is very stable and what's important it is fireproof and it works as a heater. 0,5mm and 0,7mm tin has its advantage in cutting by hand with tinman's shears. I used 4 bungs to create podium. Even corks from coke will look amazing, trust me ;)

Creating rest mountings is simple with little squares and 3mm Ø screws. To mount module PCB you can simply use 4 screws and separators made from... an old pen. Very simple and stable solution (look at the picture). The back panel with stereo RCA output is banded from tin. You can find the

cable for audio out in any PC, sometimes it comes with CD-ROM and it's normally connected as analog output to soundcard.

Front panel of CD-ROM looks well when it's black. The watch glass is made from 5mm transparent plexiglass. 3mm thick will be good also. The dimension of watch glass are not restricted. I found that using black insulating tape from outside looks pretty and fit into any dimension.

4. Steps

Download PCB layouts here: http://www.edw.com.pl/pcb/avt2660.zip and make one for driver and another for buttons. They are double layer PCB. If you don't know how to make them, ask your friend. There are plenty of methods to create your own PCB's.

The format in which they become is Autotrax which can be freely downloaded from this address: http://www.altium.com/community/support/downloads/

Buy programmer for Atmel microcontroller and one chip. It can be ATMega8515 or older AT90S8515.
Configure it and put this software: www.kleo.ovh.org/still/avt2660_v3.zip into the Flash.

Configuration of Fuse Bits for ATMega8515 is here:
High = 0xC1,
Low = 0x1F
that means:
S8515C = 1,
WDTON = 1,
CKOPT = 0,
EESAVE = 0,
BOOTSZ1 = 0,
BOOTSZ0 = 0,
BOOTRST = 1,
BODLEVEL = 0,
BODEN = 0,
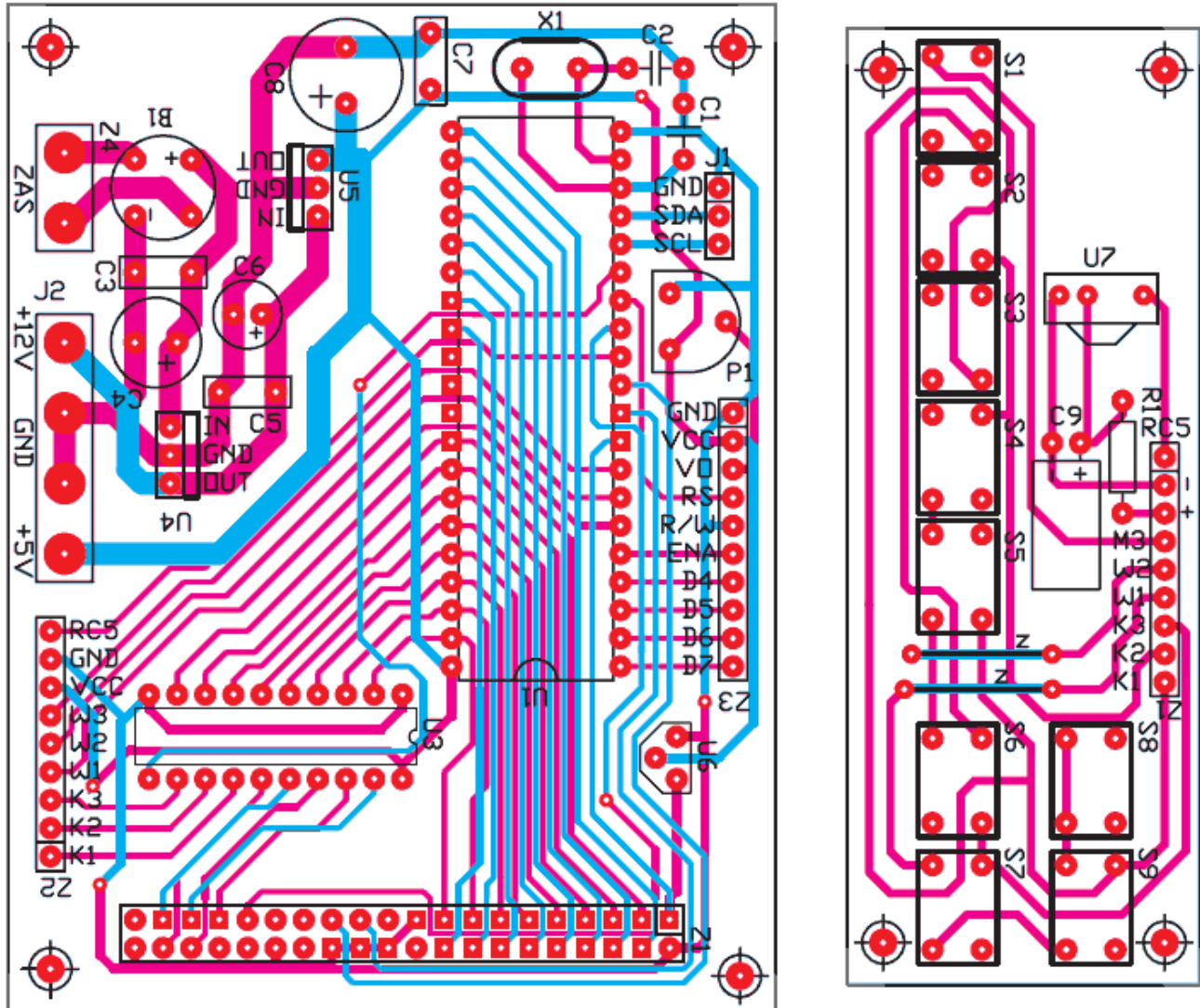SUT1 = 0,
SUT0 = 1,
CKSEL3 = 1,
CKSEL2 = 1,
CKSEL1 = 1,
CKSEL0 = 1

This project with number AVT2660 was described by AVT Corp. in magazine EdW (Electronics for Everyone) in March 2003 by Marcin Wiązania. This software is the 3rd version made by enthusiast Chroost. More information are available in the polish forum www.elektroda.pl and EdW magazine homepage www.edw.com.pl. Info about publication and ordering electronic kit AVT2660 (including parts, PCB and IC programmed with 1st version of firmware) are here: www.sklep.avt.com.pl.

5. Assembly

Assembly Diagram:

Pin called SCL is pin 16 used for describing which drive is currently working. (+5V for CD1, 0V for CD2). Pin called SDA is pin 17 used for mute/standby (+5V if player is paused or stopped). The original PCB is designed to use with any transformer with 25W power and 15-25V output. In my mod, when ATX power supply is used, you don't need the bridge rectifier (B1), voltage regulators (U4 and U5), filtering caps (C3, C4, C5, C6), also +12V is needed only for CD-ROMs. Z means short-circuited.

Parts list:

resistors
mounting potentiometer 1kΩ (contrast)
R1   220Ω

capacitors
C1,C2   27pF
C3,C5,C7   100nF
C4,C6,C8   1000μF/25V
C9   100μF

semiconductors
U1   ATMega8515
U2   LCD 2x16
U3   74HC573
U4   78S12
U5   78S05
U6   DS1813
U7   TFMS5360 (IR module)
B1   1,5A bridge-rectifier
X1   8.00 MHz Crystal

mechanical:
S1-S9   micro-switches
Z1   goldpin 2x20 (for IDE cable)
Z2   goldpin 1x9 (for keyboard)
Z3   goldpin 1x10 (for LCD)

others:
2x500Ω for LED and LCD backlight
LED diode
stereo RCA output with chassis mounting
any turn on/off switch
2x multi-conductor cable 10 inch (25cm) long (with 10 cores) for keyboard and LCD.

computer parts:
ATX power supply
1 or 2 CD-ROMs with CD-Text
2 jumpers to set them MASTER and SLAVE
1x40pin IDE cable
1 analog audio cable for optical drive
AC cord

- optional

- used only with transformer to supply, when ATX PS used no need it.

6. Using

If you have flashed IC and assembled everything together, you need to test your RC-5 remote control, keyboard and display to work properly. Set the right contrast and optionally change resistors for backlight and LED to achieve the best brightness.

Keyboard description:
S1 – skip (−)
S2 – play
S3 – pause
S4 – stop
S5 – skip (+)
S6 – rewind
S7 – fast forward
S8 – time mode
S9 – play mode

Pressing stop will stop playback. Pressing second time will set track 01, third time will eject disc.

Remote setup:
1. Turn off device
2. Click and hold S9 button
3. Turn on player and release S9 button.
4. On the display you will see '**IR SETUP**' label
5. Code all desired buttons. If some of them are used '**IN USE!**' will appear. If button was programmed correctly you will see '**OK**' text.
6. After setup your remote is ready to work.

CD-Text Setup:
After flashing IC, CD-Text option is set to auto. The text will be shown only if decoded properly. Title, artist and name of disc can be displayed in the second row with maximum 160 signs.

To turn off CD-TEXT feature:
1. Turn off device
2. Click and hold S3 button
3. Turn on player and release S3 button.
4. '**CD-TEXT OFF**' will appear. Now CD-Text is turned off.
To turn on CD-TEXT:
Repeat the same steps from text above, '**CD-TEXT AUTO**' will appear.

Firmware version checking:
  1. Turn off device
  2. Click and hold S4 button
  3. Turn on player and release S4 button.
  4. Firmware version will appear.

Using with 2 drives (changer function):
Press S8 while playback is stopped or '**NO DISC**' displayed. This will change (default) CD1 to CD2 operation. If no second drive is available '**NO-DISC**' will be diplayed.

Tested drives:

- CD-ROM LG CRD-8483B
- CD-ROM LG CRD-8522B
- CD-ROM LG GCR-8523B (*)
- CD-RW LITE-ON LTR-32125W (*)
- CD-ROM ASUS CD-S520B2 (*)
- CD-RW LG GCE-8527B (*)
- DVD-RW SAMSUNG SH-S162L (*) – crash sometimes
- DVD-ROM LG GDR-8164B – doesn't work

* CD-Text available

7. Contact and acknowledgements

You can contact me at email: mkleo@o2.pl

Acknowledgements for guys who decided to put great effort in this project.

Author of project and first firmware: Marcin Wiązania
Author of 2nd and 3rd firmware: Chroost
Tester: mdm150

kits and PCBs available in AVT Corp. www.sklep.avt.com.pl